High-Efficient Maximum Power Point Tracking of Solar Photovoltaic using Modified Particle Swarm Optimization

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Abstract—This research suggests a modified Particle Swarm Optimization (PSO) technique for the maximum power point tracking (MPPT) of solar photovoltaic (PV) panels to improve efficiency. A boost converter is integrated into the system architecture to raise battery current and increase overall efficiency. The proposed algorithm controls the interaction between generation from solar PV and connected loads in such a way as to optimize PV efficiency. In solar availability time, it gives priority to using solar energy by employing MPPT for extracting the maximum power possible. The novelty of this study is the application of a modified PSO for the MPPT in solar panels. The performance of the proposed algorithm is validated by a simulation review and analysis via experiments. The key performance indicators include efficiency of charging, the level of renewable energy utilized and availability. Through this research, it was observed that by using the proposed modified PSO-based MPPT an efficiency of 94.7% could be achieved.

Keywords—MPPT, Optimization, Particle Swarm Optimization, Solar Photovoltaic, Efficiency